

Title: Design a Flag

Brief Overview:

Students will apply knowledge of fractions to design a flag. They will divide a given area into equivalent fractional parts. They will use an 11 x 11 geoboard to develop their flag designs.

NCTM 2000 Principles for School Mathematics:

- **Equity:** *Excellence in mathematics education requires equity - high expectations and strong support for all students.*
- **Curriculum:** *A curriculum is more than a collection of activities: it must be coherent, focused on important mathematics, and well articulated across the grades.*
- **Teaching:** *Effective mathematics teaching requires understanding what students know and need to learn and then challenging and supporting them to learn it well.*
- **Learning:** *Students must learn mathematics with understanding, actively building new knowledge from experience and prior knowledge.*
- **Assessment:** *Assessment should support the learning of important mathematics and furnish useful information to both teachers and students.*
- **Technology:** *Technology is essential in teaching and learning mathematics; it influences the mathematics that is taught and enhances students' learning.*

Links to NCTM 2000 Standards:

- **Content Standards**

Number and Operations

Mathematics instructional programs should foster the development of number and operation sense so that all students develop understanding of fractions as parts of unit wholes, and as parts of a collection; use models, benchmarks, and equivalent forms to judge the size of fractions; and recognize and generate equivalent forms of commonly used fractions.

Geometry

Mathematics instructional programs should include attention to geometry and spatial sense so that all students select and use different representational systems, including coordinate geometry.

Measurement

Mathematics instructional programs should include attention to measurement so that all students understand attributes, units, and systems of measurement and apply a variety of techniques, tools, and formulas for determining measurements.

• Process Standards

Problem Solving

Mathematics instructional programs should focus on solving problems as part of understanding mathematics so that all students build new mathematical knowledge through their work with problems and monitor and reflect on their mathematical thinking in solving problems.

Reasoning and Proof

Mathematics instructional programs should focus on learning to reason and construct proofs as part of understanding mathematics so that all students develop and evaluate mathematical arguments and proofs and select and use various types of reasoning and methods of proof as appropriate.

Communication

Mathematics instructional programs should use communication to foster understanding of mathematics so that all students express mathematical ideas coherently and clearly to peers, teachers, and others and use the language of mathematics as a precise means of mathematical expression.

Connections

Mathematics instructional programs should emphasize connections to foster understanding of mathematics so that all students recognize and use connections among different mathematical ideas; understand how mathematical ideas build on one another to produce a coherent whole; and recognize, use, and learn about mathematics in contexts outside of mathematics.

Representation

Mathematics instructional programs should emphasize mathematical representations to foster understanding of mathematics so that all students create and use representations to organize, record, and communicate mathematical ideas; develop a repertoire of mathematical representations that can be used purposefully, flexibly, and appropriately; and use representations to model and interpret physical and mathematical phenomena.

Grade/Level:

This unit is to be used by students in Grades 4 and 5.

Duration/Length:

This unit is to be completed during three – 45 minute class sessions.

Prerequisite Knowledge:

Students should have working knowledge of the following skills:

- Basic computation skills (addition)
- Use of a geoboard
- Recognizing a fraction
- Identifying parts of a whole

Student Outcomes:

Students will:

- compare fractions.
- identify equivalent fractions.
- demonstrate fractional parts by cutting, folding, and shading paper and using geoboards and Fraction Islands.

Materials/Resources/Printed Materials:

- 11 x 11 geoboards (1 per student)
- Rubberbands
- Fraction Islands
- Pencils
- Crayons
- Overhead geoboard of Fraction Islands
- Three small loaf cakes
- Index cards
- Scissors
- Construction paper
- Glue
- Student Resource Sheets #1-7
- Teacher Resource Sheets #1-3

Development/Procedures:**Day 1**Teacher Introduction

- Introduce vocabulary words, fraction and equal.
- Using three small loaf cakes, divide each cake into halves, thirds and fourths.
- Write the corresponding fraction on the board.
- Have the class compare the various slices.

Guided Practice

- Distribute shapes found on Student Resource #1.
- Students should cut out and fold shapes to demonstrate halves, thirds and fourths.
- Students should label the number of equal parts on each square.

Student Activity

- Distribute shapes worksheets, Student Resources #2 and #3, and one piece of construction paper to each student.
- Students should color the number of requested spaces and write the fraction colored.
- Divide construction paper into three columns, labeled halves, thirds, and fourths.
- Cut and glue shapes in the corresponding column.

Assessment

- Check work for understanding

Day 2

Warm-up and Review

- Introduce vocabulary, equivalent fraction.
- Divide the class into groups of 4 – 5 students and distribute three index cards to each group.
- Students should write $\frac{1}{2}$, $\frac{1}{3}$, and $\frac{1}{4}$ on the index cards.
- Write a fraction on the overhead projector and have students hold up the corresponding equivalent fraction (e.g., $\frac{2}{4}$ is the same as $\frac{1}{2}$).

Guided Practice

- Distribute geoboards and pink, light blue, dark blue, and brown Fraction Islands. Allow students five minutes to explore.
(Teacher should use the overhead projector to work along with the students and write the corresponding fractions.)
- Have students make a 3 x 4 unit on their geoboard.
- Demonstrate how to make halves, thirds, and fourths using the Fraction Islands. Allow students to work with you.

Student Activity

- Students should make an additional unit – 6 x 8 beside the 3 x 4 unit.
- Working in groups of 4 – 5 students, have students form different equivalent fractions using the two different units and Fraction Islands.
Ex: 1. Shade in $\frac{1}{3}$ of the 6 x 8 unit using 1 pink island.
2. Find $\frac{1}{3}$ of the 3 x 4 unit and shade that in using 2 brown islands.
(Teacher should see Teacher Resource #1 for other equivalent fractions.)
- Distribute Student Resource #4.
- Instruct students to copy three equivalent fraction models from the geoboards onto the grid paper and write the corresponding fraction.

Assessment

- Check work for understanding.

Day 3

Warm-up and Review

- Review vocabulary.
- Distribute geoboards and Fraction Islands.
- Instruct students to make a 6 x 8 and 3 x 4 unit on their geoboards.
- Allow 15 minutes to make different equivalent fractions using Fraction Islands.
(Same as Day 2 activity)

Student Activity

- Introduce vignette, Student Resources #5.
- Allow students time to develop a flag model on their geoboards.
- Students should transfer their pictures from the geoboards to Student Resources #6-7.

Assessment

- Complete rubric by using Teacher Resources #2 and 3.

Performance Assessment:

The students will complete a flag design on the final day. The flag design will be evaluated using one of the rubrics provided. The teacher will be assessing proper usage of equivalent fractions, grammar, mechanics and usage, spelling, clear language, neatness and following directions.

Extension/Follow Up:

Math Activities

- Use the multiplication table to identify equivalent fractions.
- Compare non-equivalent fractions using geoboards and Fraction Islands.

Language Arts Activities

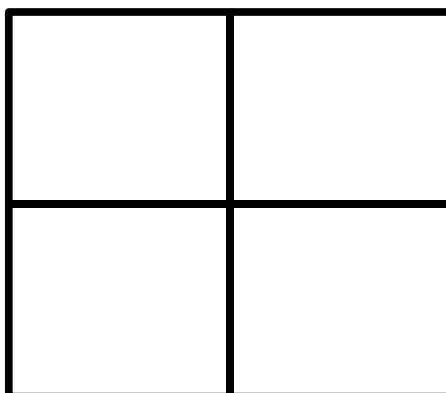
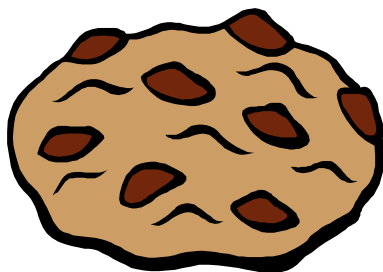
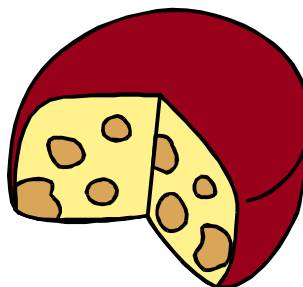
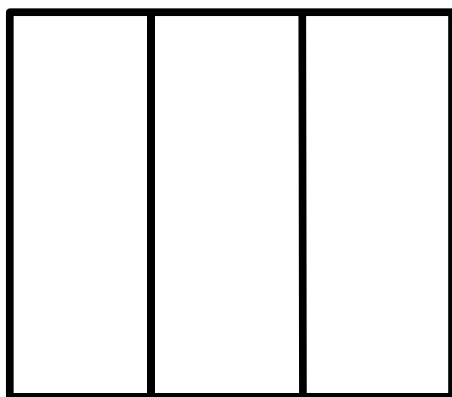
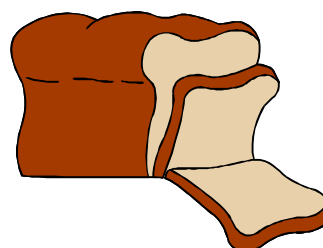
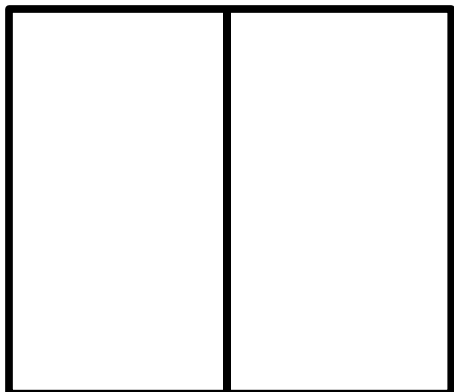
- Brainstorm ideas of how fractions are used in everyday life.
- Write about a time that you used fractions outside of math class.
- Write a persuasive essay explaining why your flag should be chosen.

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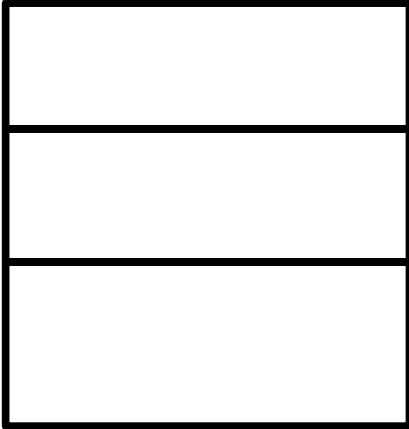
Student Resource #1



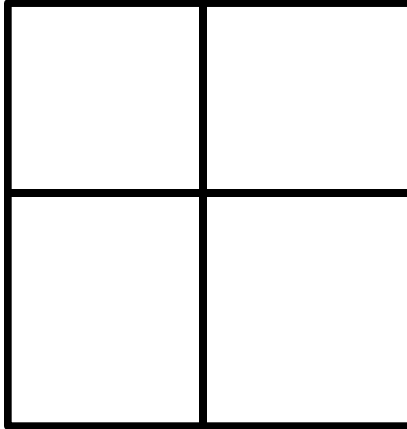
Student Resource #2

1. Color the specified number of spaces.
2. Cut out the shapes and glue them on construction paper under the appropriate column.

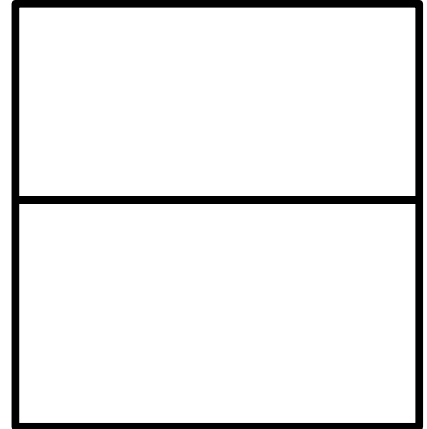
Color 1



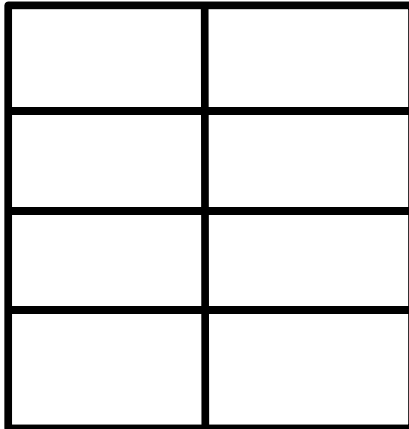
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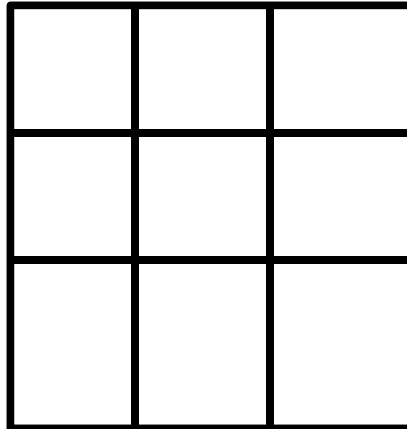
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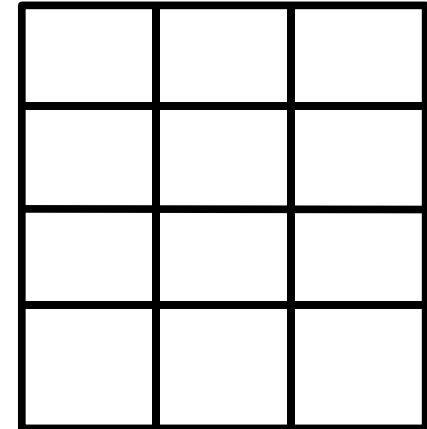
Color 4



Color 3



Color 3



Student Resource #3

Color 4

Color 3

Color 5

Teacher Resource #1



Key for comparing fractions using grouped island pieces

Fraction Part

6 x 8 unit

3 x 4 unit

$\frac{1}{3}$

2 dark blue

1 pink

$\frac{1}{2}$

4 brown

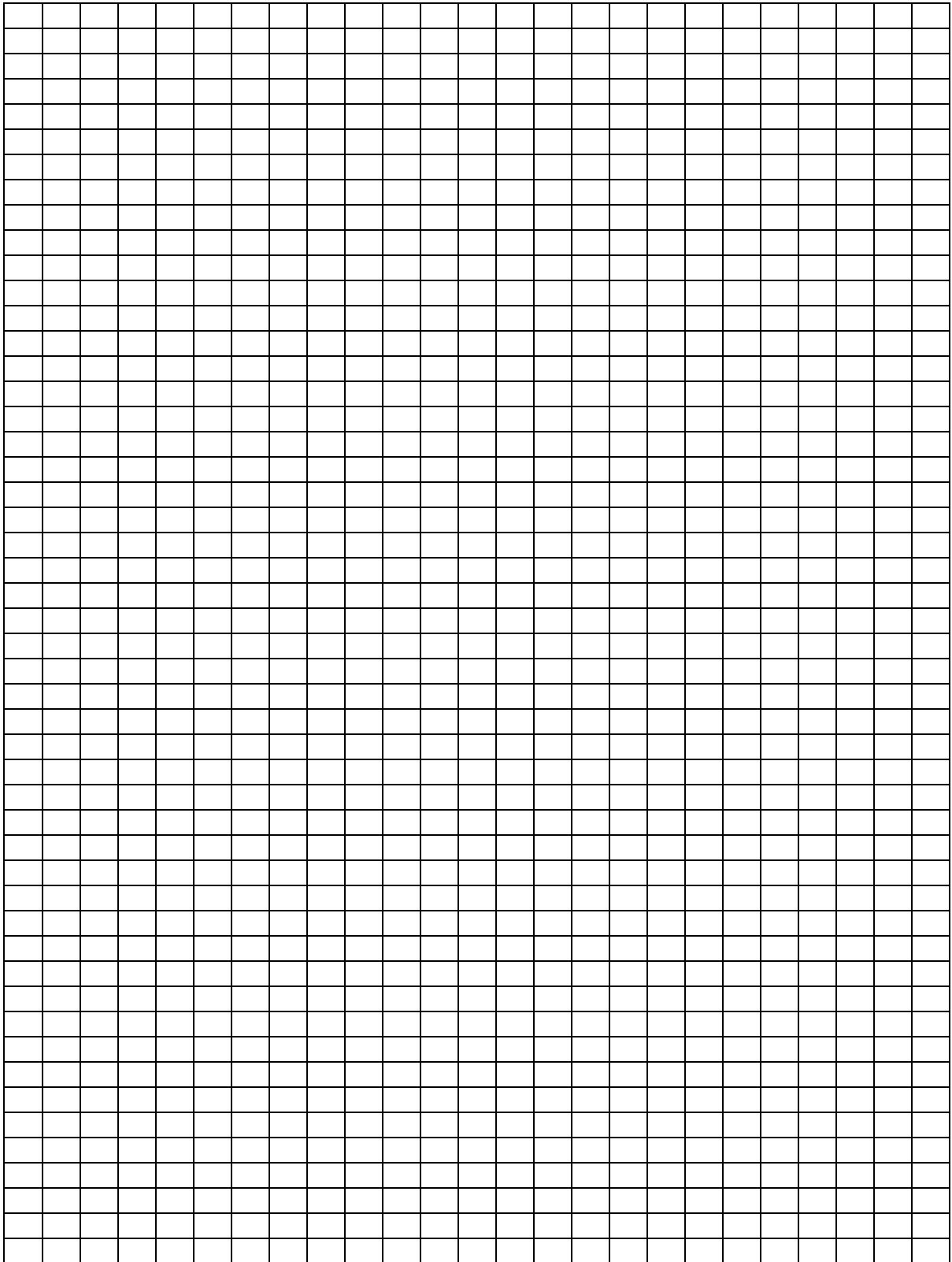
2 light blue

$\frac{1}{4}$

2 brown

1 light blue

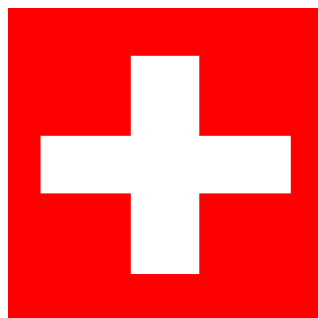
Student Resource #4





Flag Designs

To celebrate the opening of our new school building, the students in your class have been given the honor to design a new school flag. Only one design will be selected for the school flag. This is a contest. It is important that you follow the directions. On your piece of flag paper, create a flag with three equivalent fraction designs in the given three blocks. The fourth block should contain a written explanation of how you know the three areas are equivalent. (Use math terms in explanation. EX. – equal, area, equivalent etc....) Be creative with your design and make sure your equivalent fractions represent different aspects of your school.



Flag Rubric

- 3- Flag should be broken into three equivalent fractions.
 - The student's explanation of the design is written in clear and concise math language.
 - The student's writing contains few to no grammatical, mechanical, or spelling errors.
 - The flag design is neat and creative.
- 2- Flag should be broken into three equivalent fractions.
 - The student's explanation uses appropriate description, but poor choice of words. Math language is not clear.
 - The student's writing has many grammatical, mechanical, or spelling errors.
 - The flag design is neat.
- 1- Flag was broken into two equivalent parts.
 - The explanation of design was poor. There was no usage of math language.
 - The writing has inappropriate mechanical, grammatical, or spelling usage.
 - The flag design is not neat.
- 0- Student made no attempts to design a flag or to write an explanation.

Teacher Resource #3

Rubric

	3	2	1	0
Three Equivalent Fractions				
Clear Explanation				
Clear Usage of Math Language				
Grammar, Mechanics, and Spelling				
Neatness				
Following Directions				
Total				

Student Name _____

Date _____